

wafer perimeter would be lowered and thus cause a non-uniform etching during an ion assisted/driven etch. Because the diffusion barriers compromise the quality of an ion-driven etch, separate plasma processing chambers are often used when both ion-assisted etching and chemically driven etching is to be performed. Correspondingly, the present invention relates to a semiconductor manufacturing apparatus having a diffusion barrier that can be positioned in multiple positions relative to a wafer. In one position, the diffusion barrier acts to inhibit diffusion of neutral species which may compromise etch quality of chemically driven etch processes. In another position, the barrier is recessed so as to not disturb an ion-assisted etch process.

Rejections Under 35 U.S.C. § 103

Claims 1-13 are rejected under 35 U.S.C. §103 as being unpatentable over U.S. Patent 5,213,658 to Ishida (hereinafter referred to as “Ishida”) in view of U.S. Patent 6,042,687 to Singh et al. (hereinafter referred to as “Singh”). Applicants respectfully disagree.

Firstly, Applicants submit that combining the cited prior art as proposed in the Office Action is improper.

In column 2, lines 15-30, Singh unmistakably states that systems that use focus rings, or diffusion barriers, are unattractive. Specifically, Singh states that “one problem with systems employing focus rings is that polymers generated from gaseous by-products or reactants are sometimes deposited on the focus rings. During subsequent substrate processing, this deposited polymer can cause undesirable contamination of the substrate being processed.” Clearly, Singh does not use a diffusion barrier, would not use a diffusion barrier, unambiguously teaches against any barrier such as a barrier as recited in independent claims 1 and 8, and teaches against focus ring usage as described by Ishida.

The Examiner asserts that it would have been obvious to modify Ishida by using the focus rings as taught by Singh. Singh doesn’t use a focus ring. And Singh explains why this is undesirable. Applicants respectfully submit that the references must be taken in their entirety, including those portions which argue against an obvious combination. Bausch & Lomb, 230 U.S.P.Q. at 420. Since Singh explicitly teaches against the use of focus rings, the combination of Singh and Ishida as proposed in the Office Action is improper.

Moreover, the present invention recites a barrier. Correspondingly, Singh plainly teaches away from the present invention. With respect to obviousness, the courts and MPEP have long cautioned that consideration must be given “where the

references diverge and teach away from the claimed invention". Akzo N.V. v. International Trade Commission, 1 U.S.P.Q. 2d 1241, 1246 (Fed. Cir. 1986). Thus, Applicants respectfully submit that using Singh to obviate the present invention is improper.

For prior art references to be combined to render obvious a subsequent invention under Section 103, there must be something in the prior art as a whole that suggests the desirability, and thus the obviousness of, making the combination. In contrast, the combination of prior art cited in the Office Action includes no such motivation; and Singh indeed includes explicit support for non-combination with the focus ring of Ishida. As a whole, Singh uses gas jets because he feels focus rings are undesirable.

For at least these reasons, Applicants respectfully submit that the proposed combination of prior art is improper. In addition to the improper combination, the cited references, either alone or in combination, fail to teach features recited in the independent claims.

For example, Ishida and Singh, either alone or in combination, fail to teach a "barrier having a first position relative to the wafer wherein the first position relative to the wafer substantially facilitates etch uniformity for a chemically driven etch process, and having a second position relative to the wafer wherein the second position relative to the wafer does not interfere with the etch uniformity of an ion driven etch process" as recited in claim 1. The art of record does not teach or remotely suggest a processing chamber suitable for chemically driven etch process and ion-assisted etch processes. For at least these reasons, the art of record does teach or remotely suggest a barrier as described in independent claim 1.

Singh is concerned with gas supply and does not remotely suggest all the limitations of independent claims 1 and 8. Ishida is concerned with optimizing the performance of a focus ring for one type of semiconductor fabrication and does not teach or suggest a second position relative to the wafer that does not interfere with the etch uniformity of a second semiconductor etch process type. Since Ishida and Singh, either alone or in combination, do not teach or remotely suggest all the limitations of the independent claims, the cited references, either alone or in combination, fail to render the claimed invention obvious.

Therefore, Applicants respectfully submit that all aspects of the independent claims are not taught or suggested by the art of record, either alone or in combination; that combining the cited prior art as proposed in the Office Action is improper; and that independent claims 1 and 8 are patentable.

Claims 2-7, and 9-13 each depend either directly from independent claims 1 and 8, respectively, and are therefore respectfully submitted to be patentable over the art of record for at least the reasons set forth above with respect to the independent claims. Further, the dependent claims recite additional elements which when taken in the context of the claimed invention further patentably distinguish the art of record.

Withdrawal of the rejection of claims 1-13 based on 35 U.S.C. § 103(a) is therefore respectfully requested.

Conclusion

In view of the foregoing, Applicants believe that all pending claims are allowable and respectfully requests a Notice of Allowance for this application from the Examiner. Should the Examiner believe that a telephone conference would expedite the prosecution of this application, the undersigned can be reached at the telephone number set out below.

If any fees are due in connection with the filing of this paper, the Commissioner is authorized to charge such fees to Deposit Account 50-0388 (Order No. LAM1P111).

Respectfully submitted,
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Limited Recognition under 37 C.F.R. §10.9(b)

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